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OLD WINE IN NEW BOTTLES?
DOES CLIMATE POLICY DETERMINE BILATERAL DEVELOPMENT AID FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY?

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Abstract
Since the UN Conference on Environment and Development in Rio de Janeiro in 1992 bilateral and multilateral donors have stressed that development assistance has increasingly been oriented towards climate-friendly interventions. With respect to energy aid, this should lead to a substantial increase in projects related to renewable energy and energy efficiency. Given a new database of hundreds of thousands of bilateral development assistance projects, we can assess whether such a reorientation has indeed taken place. We find that, contrary to expectations, the share of bilaterally-funded renewable energy and energy efficiency projects did not increase over the period from 1980 to 2008. This share fluctuated greatly, following the price of oil, peaking with the second oil crisis of the early 1980s. The impacts of global climate policy treaties are minor or inexistent. 'Traditional' renewable energies such as hydro and geothermal declined, while "new" renewables showed two peaks in the early 1980s and late 1990s. Differences between donor countries are huge. Several countries, including climate sceptics such as the US and Australia, but also the UK and Switzerland, saw a consistent decline. The self-proclaimed climate pioneers such as Germany, the Netherlands, Norway and Sweden show peaks related to both the oil crises and international climate policy. Only in Austria, Denmark, Finland and Spain can 'new' climate mitigation development assistance be found.

Key words
Climate change mitigation, development assistance, energy efficiency, renewable energy

1. Introduction

Since its inception in the late 1940s development assistance has engaged in building hydro power plants. It has also tried to improve the livelihoods of marginal populations through off-grid electrification using photovoltaics or by improving the efficiency of charcoal stoves. Since the late 1980s it has become clear that such activities contribute to mitigation of climate change as they lower greenhouse gas (GHG) emissions compared to energy supply based on fossil fuels.

International climate policy has emerged as a key policy field in the last two decades, starting with the setting up of the Intergovernmental Panel on Climate Change (IPCC) in 1988 and the beginning of negotiations regarding a United Nations Framework Convention on Climate Change (UNFCCC) in 1991. The UNFCCC was adopted at the UN Conference on Environment and Development in Rio de Janeiro in 1992. Legally binding GHG emissions commitments for industrialised countries and the period from 2008 to 2012 were agreed in the Kyoto Protocol in 1997. After protracted negotiations this protocol entered into force in 2005. It contains a set of international market mechanisms, with the clean development mechanism (CDM) allowing the generation of emissions credits through GHG reduction projects in developing countries. The CDM became an unexpected success; over 5000 projects have been mobilised that are forecast to reduce carbon dioxide (CO2) by approximately 1 billion tonnes by the end of 2012 (UNEP Riso Centre, 2010). The CDM has led to the emergence of a wide range of private companies developing projects and providing consultancy to successfully complete the complex regulatory cycle. In 2005 negotiations for the period after 2012 started with a view to agreeing an international regime at the Climate Conference in Copenhagen conference held late in 2009. However, at Copenhagen agreement proved elusive and the post-2012 regime remains uncertain.

Ever since the Rio conference in 1992 combining development and climate-related efforts has been an international objective, embodied in the principle of ‘common but differentiated responsibilities’ (Centre for International Sustainable Development Law, 2002). In addition, due to the scarcity of real successes, traditional development assistance faced a confidence crisis in the 1980s. Development agencies may thus have been eager to contribute to the new and more fashionable objective of mitigating climate change. The expected trend raised some concerns about the priorities of development assistance (Michaelowa and Michaelowa, 2007).

At the same time proponents of the climate change agenda suggest that donor support for climate change mitigation in developing countries is much lower than required and that actual disbursement of climate change-related aid pledges is dismal (Vidal, 2009).

Thus, on one hand, there is the reproach that *too much* climate aid has shifted the priorities of development cooperation away from the central objective of poverty reduction. On the other hand, there is the accusation that despite all promises *too little* aid has been channelled into activities in support of the Rio Convention on Climate Change.

Due to the scarcity of reliable data, neither of the two arguments has been seriously tested so far. However, a new project-level aid (PLAID) database, available to the public since March 2010, now provides a much better source of information on the development of aid activities – including individual projects, but also programme support, budget support and so on – in this field (AidData, 2010).[1] Based on individual project descriptions, we code over 750,000

[1] For ease of exposition we will use the terms ‘project’ and ‘aid activity’ interchangeably in the context of this paper. In any case, traditional projects are still the dominant category in today’s development cooperation.

bilateral aid activities of 21 Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) donors with respect to their relevance for specific types of energy efficiency and renewable energy. We exclude multilateral aid (which, according to OECD-DAC (2002a), covered about 15 per cent of the total climate change-related aid flows) because the decision making of multilateral donors such as the World Bank is likely to depend on parameters that are different from the decision making of individual governments (Michaelowa and Michaelowa, 2010b). On this basis we address the following questions:

- Has there been a real change in development activities towards a greater emphasis on renewable energy and energy efficiency?
- And if so, what are the major drivers of this effect? Has the change come about as a consequence of the international treaties on climate policy or, more generally, of a stronger environmental consciousness in donor countries? Or is it primarily related to traditional factors such as industrial lobbies and energy prices driving decisions in development policy, and therefore unrelated to public opinion or green political ideology? Is there any interaction with the CDM which targets projects in developing countries?

In Chapter 2 we develop the conceptual framework of this analysis based on the idea that the relevance of renewable energy and energy efficiency projects could be driven either by the same traditional factors as ever ('old wine', business as usual) or by the effect of international climate policy agreements since Rio, and by environmental preferences of donor country citizens and governments. In Chapter 3 we describe the new PLAID database, our coding procedure for bilateral aid related to renewable energy and energy efficiency, and the additional political-economic variables to be considered. Chapter 4 provides an initial empirical assessment based on descriptive statistics. Chapter 5 finally brings all arguments together in an econometric analysis and Chapter 6 concludes.

2. Old wine or political impact of greener preferences in the post-Rio era: a conceptual framework

In order to distinguish between 'business as usual' and change in sectoral aid allocation related to the Rio summit and post-Rio environmental preferences of donor country citizens and governments, we develop a general framework encompassing both parts of the argument. The 'old wine' or 'business as usual' argument suggests that either nothing changed at all after 1992 or, if something changed, this should only be in relation to factors that drove such change already before 1992. In the context of aid a typical determinant of any given donor's sectoral allocation is a certain comparative advantage in the sector. In our context we would thus expect donors with relatively strong renewable energy sectors or strong know-how in energy efficiency to be particularly active in these fields, independently of the implications of the Rio summit or related environmental preferences. In addition, aid policy traditionally reacts to global economic trends that influence economic development. Since energy supply is considered vital for development, the price of oil is one important factor considered in this context. As a consequence, we expect that throughout our measurement period the high price of oil should have increased donors' support for renewable energy and energy efficiency.

The alternative policy change argument suggests a direct or an indirect impact of the Rio summit with its agreement on the UNFCCC and the following international negotiations on the mitigation of climate change, which led to the signing of the Kyoto Protocol in 1997 and its entry into force in 2005. From 2005 onwards the CDM started its great upswing with over 2000 projects registered within five years. This shows that private funds for emissions mitigation projects in developing countries can actually be mobilised and should have underpinned the case for similar, perhaps somewhat less attractive, projects financed through development assistance. Any direct impact should be reflected in a clear difference between sectoral aid allocations before and after 1992, 1997 and 2005. An indirect effect could work via these negotiations and subsequent debates shaping public and governmental preferences in donor countries. In this case we should expect changes in aid allocation to follow changes in donor government composition or, alternatively, in voters' preferences as expressed for example in their vote share for environmental parties.

In this context it is assumed that environmental policy has become such a prominent part of international and national policy debates that it may be relevant for electoral decisions. This is indeed confirmed by other studies (Michaelowa and Michaelowa, 2010a, List and Sturm, 2006, Blanke, 2002). Hicks et al. (2008, p. 160) speak of a 'political market for environmental aid in wealthy countries' and argue that 'this market is shaped by the preferences of voters within each country'.

We can summarise the above discussion through two sets of hypotheses:

(a) 'Old wine' model
H1: An increase in a donor's comparative advantage in renewable energy and energy efficiency leads to more aid for the respective sectors.
H2: An increase in the price of oil leads to more aid for renewable energy and energy efficiency.

(b) Policy change model
H3: With every new international climate policy agreement donors increase their aid for renewable energy and energy efficiency.
H4: Greener donor government preferences lead to higher aid for renewable energy and energy efficiency.
H5: Greener public preferences in donor countries lead to higher aid for renewable energy and energy efficiency.

3. The data

Our dependent variable is the share of renewable energy or energy efficiency projects in total aid. We calculate this share both in terms of project numbers and in terms of financial commitments. All aid data are retrieved from the new PLAID database (AidData, 2010) whose detailed project descriptions enable us to specify all relevant project categories. The donors' own coding as reported to the DAC is far too general and rather imprecise (Roberts et al., 2008, Michaelowa and Michaelowa, 2010a), so it cannot be used in this study.

Our coding procedure was based on the following three steps:

First, we decided on a comprehensive list of key words relevant in the context of climate change mitigation (both renewable energy and energy efficiency). These key words were derived from project types found in the CDM as listed by UNEP Riso Centre (2010). These key words include: energy, fuel switch, methane, carbon capture, industrial gas, hydro-fluoro-carbon (HFC), nitrous oxide (N2O), per-fluoro-carbon (PFC), sulphur hexafluoride (SF6), forestation, reforestation, forestry, transport, renewable, biomass, geothermal, hydro, solar, photovoltaic, wind, power, landfill, composting, waste, stove, charcoal, retrofit, rehabilitation, cogeneration, electricity, boiler, heating, flaring, steam, efficiency, manure, biogas. This key word search led to an overall output of over 30,000 projects potentially relevant for mitigation.

Second, we manually assessed the actual relevance of these projects. This procedure led us to delete the vast majority of the above projects because the key words appeared in a context unrelated to mitigation activities.

Third, we double-checked the mismatches between our coding and the more general donor coding for climate change mitigation-related projects available since 1995 to verify that no project was omitted from our coding simply for having escaped our initial mechanical search procedure. This led us to reconsider a total of 8854 projects which did not previously appear in our list of climate-relevant projects. Where necessary, our own mitigation codes were revised accordingly.[2, 3]

The explanatory variables are drawn from different sources. Oil prices are obtained from the Energy Information Administration (2010a). A donor's comparative advantage in renewable energy is drawn from a variety of sources for wind, hydro power, geothermal and photovoltaics (see Appendix 1). Green public preferences in donor countries are measured as the percentage of green seats in national parliaments (Armingeon et al., 2008). Finally, environmental preferences of the donor government are 'proxied' by the index of cabinet composition developed by Schmidt (1992) and updated by Armingeon et al. (2008). The index takes on values from 1 (hegemony of right-wing and centre parties) to 5 (hegemony of social-democratic and other left-wing parties). As ecological preferences are only imprecisely reflected in a left-right dimension (Knill, Debus and Heichel, 2010, p. 304), the ideal indicator would more closely reflect party positions (the indicator based on the assessment of party manifestos by Cusack and Engelhardt (2002) for example), but such data are not available for the whole time period under consideration and thus the Armingeon et al. (2008) index was retained.

In order to reflect direct policy change in response to international agreements, we construct dummy variables for the periods from 1992 (post-Rio), from 1997 (post-Kyoto) and from 2005 (post-Kyoto ratification) onwards.

Before considering all these variables jointly in a multivariate regression model we will now look at the development of aid for energy efficiency and renewable energy over time and see, whether this directly suggests certain relationships.

4. Renewable energy and energy efficiency in the PLAID database since 1970: an overview

Considering all mitigation projects jointly, we cover the overall development of aid for renewable energy and energy efficiency. Figure 1.1 shows mitigation projects as a share of

[2] Roberts et al. (2008) and Roberts, Weissberger and Peratsakis (2010) use more sophisticated coding methods based on a sub-sample of projects and machine-based recoding using a learning algorithm. We could not follow their procedures because we required information on all projects and detailed sub-categories within very limited time. However, the order of magnitude for the share of projects in the overall mitigation category seems to correspond between their approach and ours.

[3] For further details on our coding procedure see Michaelowa and Michaelowa (2010a), Appendix 1.

overall projects, while Figure 1.2 shows the corresponding shares in terms of commitments.[4] We add another time series for the evolution of the price of oil in Figure 2. Comparing Figure 1.1 and 1.2 it is directly evident that projects contributing to the mitigation of climate change show a distinct peak during the second oil crisis of 1979-85. It appears plausible that during this period renewable energy projects became fashionable to reduce the oil import bill of developing countries. After the oil price crash in 1986 project inflow remained stable throughout the 1990s, before decreasing with a certain lag after the oil price low of the late 1990s.

At the same time there is no visible impact of the climate policy decisions of the 1990s such as the signing of the UNFCCC in 1992, its entry into force in 1994 and the signing of the Kyoto Protocol in 1997. Even after the entry into force of the Kyoto Protocol in 2005, and the debates about massively increasing financial flows to developing countries in the run-up to the Copenhagen conference late in 2009, mitigation project shares did not rise significantly above the level of the 1990s.

In terms of commitments, inter-annual variability is much larger due to 'lumpy' large projects (see Figure 1.2). Still, two peaks during the second oil crisis and the mid-1990s – which might be linked to the Rio summit and entry into force of the UNFCCC – can be distinguished. However, just as in the case of project numbers, there is no long-term increase in mitigation-related assistance, a fact that rather supports the thesis of 'old wine'. Overall, mitigation projects are about three times larger than the average development assistance project.

In order to see which changes occurred in detail, we will now proceed with a more fine-grained assessment of projects according to different categories. And in order to avoid the dominance of single large projects in our graphical representation, we focus on project shares. We also expect that aid agency staff may concentrate on specific aid activities within their reach rather than optimise overall expenditure related to climate policy. If this is true, it should be easier to explain project shares than shares in overall aid commitments.

4.1 Renewable energy

We start with a discussion of hydro and geothermal power, technologies that have been mature for a long time. After covering those we look at more novel technologies, many of which were initially developed in industrialised countries as a reaction to the two oil crises of the 1970s and 1980s. Generally, the more mature the technology becomes, the higher the share of private sector investments, until development assistance covers only projects in countries with a dismal investment climate or lacking experience with application of the technology. The CDM has accelerated this development due to the revenues generated by the sale of emissions credits.

Figures 1, 3-7: colonnes de gauche : % ?

[4] It does not make sense to consider absolute numbers here because both project numbers and financial volumes have considerably increased over time. Overall commitments covered by PLAID increased from USD 20 billion (constant 2000) in 1973 to almost USD 100 billion in 2008. Financial volumes can be measured only in terms of commitments, not in terms of disbursements, since, at least at project level, this variable has too many missing values in the dataset. Since the 1990s aid reporting shows a tendency to split large projects into many smaller ones.

Figure 1: Overall development of mitigation aid over time

Figure 1.1: Share of climate change mitigation projects in total aid projects

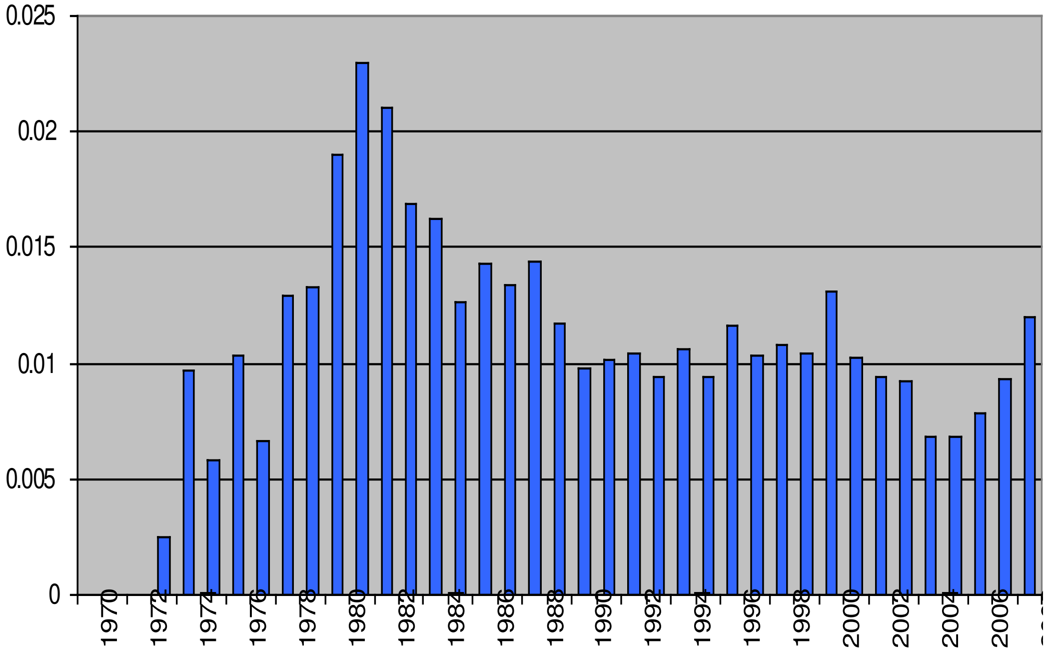
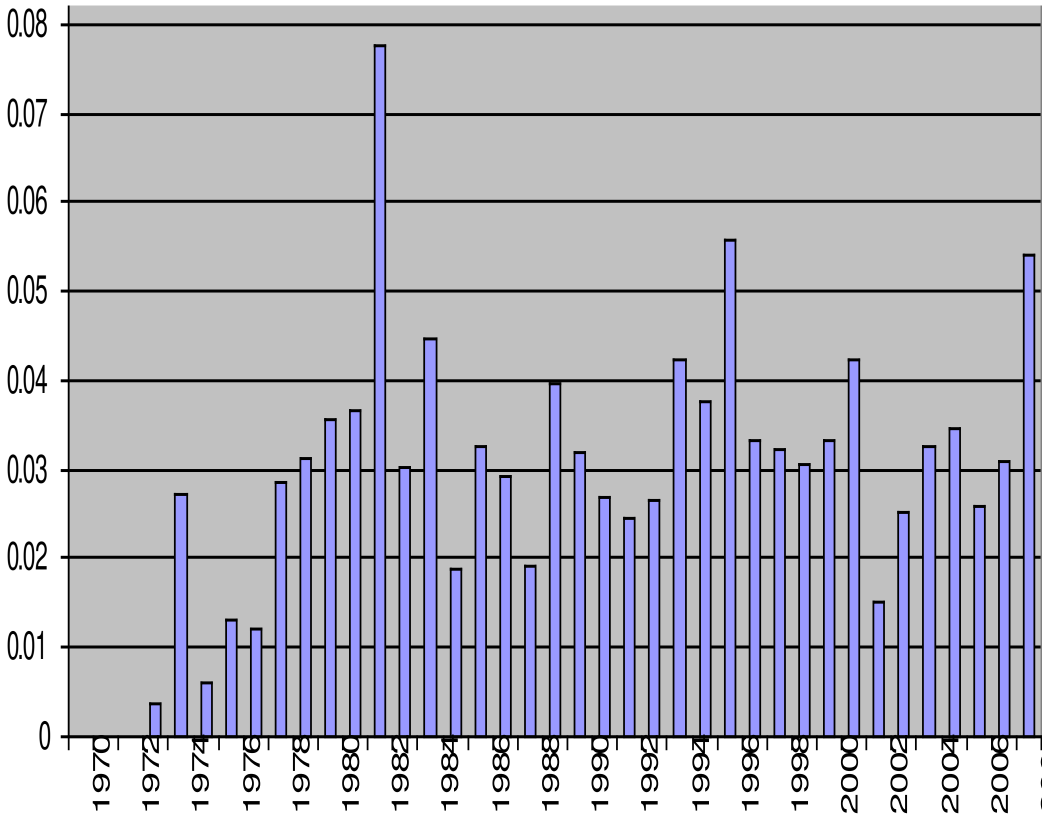
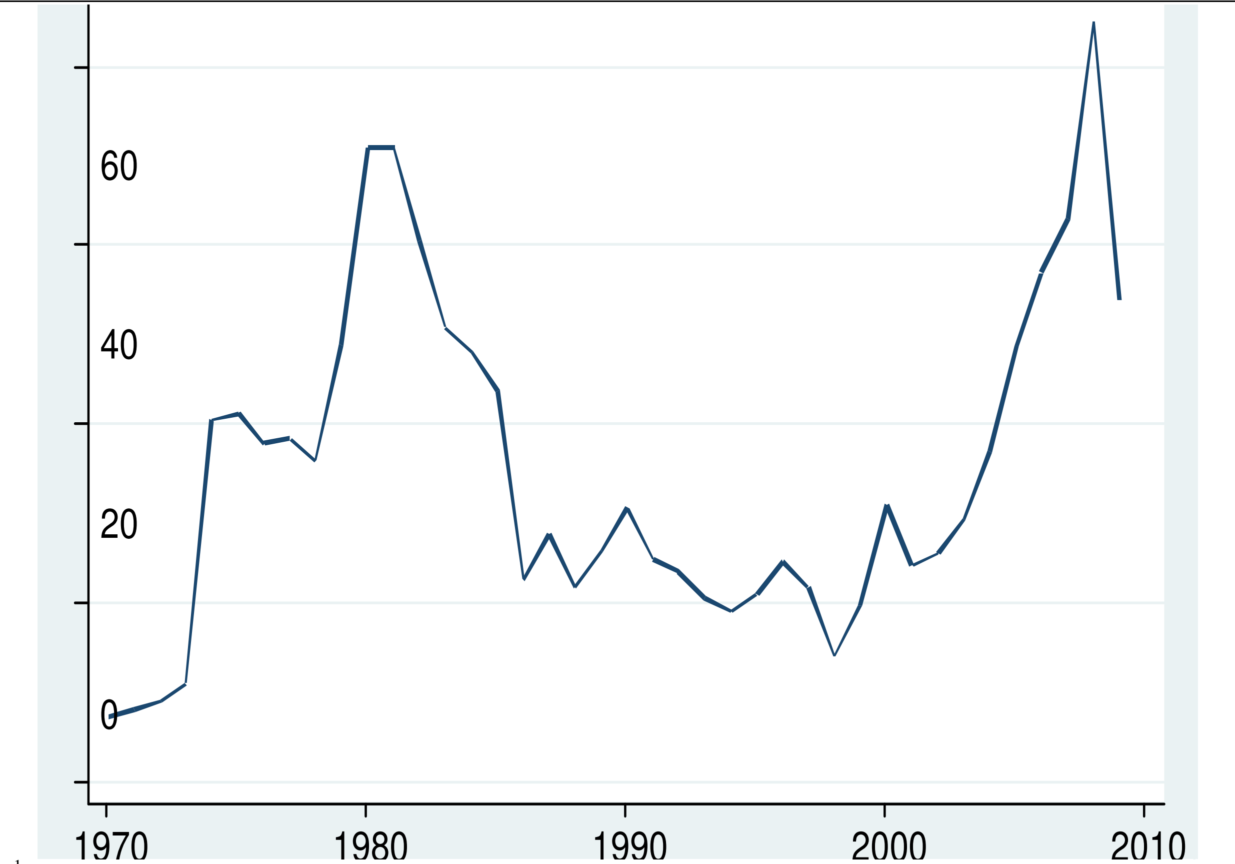


Figure 1.2: Share of mitigation projects in overall commitments



Source: AidData (2010), authors' coding

Figure 2: Evolution of oil prices[1]



[1] In constant 2005 USD. For details see Annex 1.

Source: Energy Information Administration (2010a)

It seems that the second oil crisis led indeed to a scramble for renewable energy in development assistance, epitomised by the UN Conference on New and Renewable Sources of Energy held in Nairobi in 1981. The conference proposed a USD 5 billion programme for non-hydro power renewables just for feasibility studies, research and other pre-investment activities. This never materialised due to the oil price reduction starting in 1986. By the late 1980s many donors had become disillusioned and many aid recipients had come to view renewables as second-class technologies that industrialised countries were unwilling to adopt themselves (Kozloff and Shobowale, 1994). However, new renewables have seen a real upswing since the 1990s in which climate policy may have played an important role. In addition, the third oil crisis of the mid-2000s appears to be relevant as a driving force.

Commercial hydro power has existed for over 100 years and dominates electricity generation in a large number of countries. In the 1950s and 1960s large dams were seen as a panacea to mobilise energy that would then automatically lead to industrial development. These expectations were, however, often disappointed. One of the most famous examples is the huge Akosombo dam, hydro power plant and associated aluminium smelter on the Volta river in Ghana completed in 1966. Darden Graduate School of Business Administration, University of Virginia (1999), neatly describes how Ghana suffered from the project in many respects. Two-thirds of the electricity was sold to the aluminium company at the derisory tariff of USD 0.0026 per kWh for a period of 50 years despite the recommendation of the World Bank to fix the tariff at USD 0.0045 per kWh (Faber, 1990). Ghana financed 40 per cent of the total dam and aluminium smelter cost of USD 250 million directly from the budget and another 40 per cent were covered by loans from a variety of sources. Due to the strong hydrological variability, there was no firm power available for local industrial development and Ghanaian development failed to take off.

It seems that the mixed experiences with hydro power did not, however, deter donors from pushing hydro projects during the second oil crisis as the only large and technologically mature electricity generation alternative to fossil fuels (see Figure 3.1). Since the late 1980s hydro projects have been attacked by non-governmental organisations (NGOs) due to their negative consequences for the local population without adequate compensation, with strong resistance focusing on dam projects in China (Three Gorges), India (Narmada) and Brazil (Amazonian dams like Tucurui). Moreover, environmentalists started to worry about methane emissions from rotting tropical biomass flooded by reservoirs (Fearnside, 2002). An often overlooked but key reason for the decline of hydro projects was that power generation costs of fossil power plants fell from the 1980s onwards (IEA and NEA, 2005), while hydro power costs tended to increase. After the World Commission on Dams (2000) recommendations, which managed to reduce the conflicts between dam builders and the local population through early participation of potentially impacted stakeholders, detailed benefit sharing mechanisms and allocation of funds for an effective monitoring and evaluation system covering project performance, safety and impacts, a stabilisation of project inflow has been seen, albeit on a very low level.

Geothermal energy has been exploited commercially in Italy for over a century and in New Zealand and the United States (US) since the Second World War. As it requires volcanic heat, its application in developing countries has been concentrated in South-East Asia. The oil crises of the 1970s and 1980s triggered great interest as the technology could immediately be implemented on a large scale (see Figure 3.2); at 56 per cent it got the lion's share of funding for 'non-large' hydro renewables in the period from 1979 to 1991 (Kozloff and Shobowale, 1994, p. 18). With the fall in oil and coal prices, geothermal power became uncompetitive. After the 1990s the demise of the Suharto government in Indonesia, which had actively pushed geothermal development despite high costs (Waldman and Solomon, 1998), led to a near freezing of project inflow.

Figure 3: Traditional renewable energy

Figure 3.1: Hydro projects as a share of all aid projects

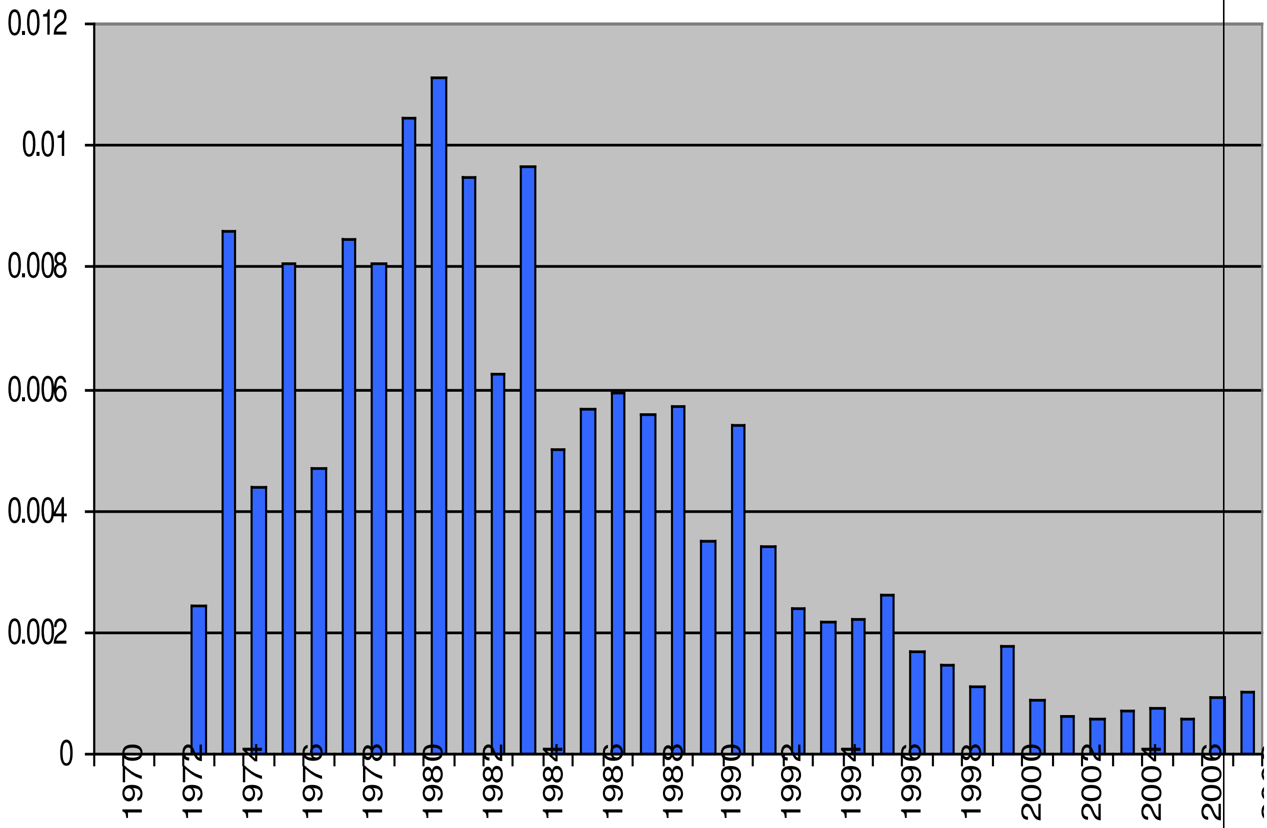
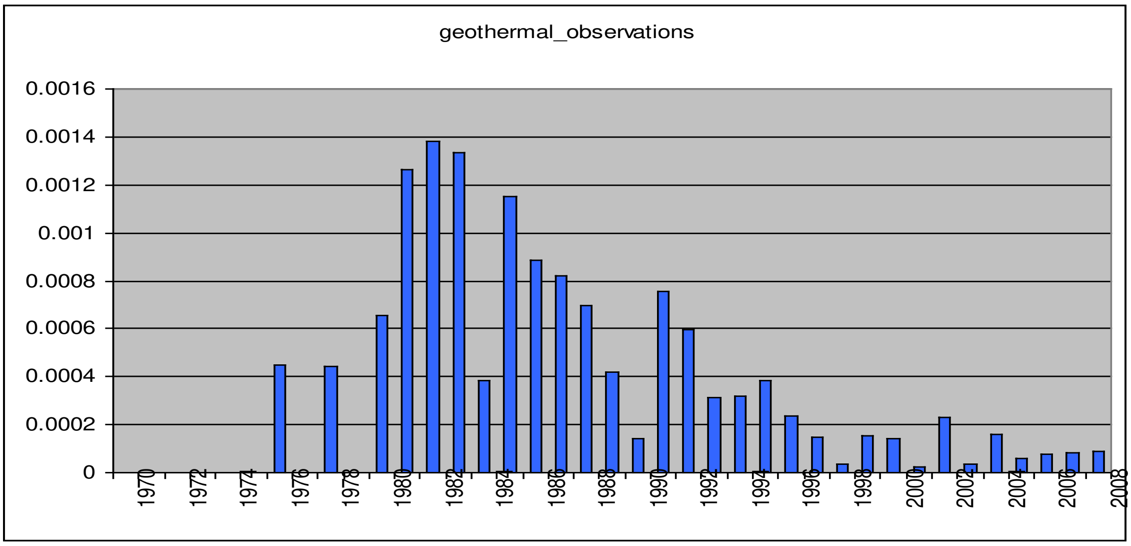


Figure 3.2: Geothermal projects as a share of all aid projects



Source: AidData (2010), authors' coding

Solar energy is a decentralised energy form well suited for development of remote rural areas, if maintenance can be assured. As immediately evident from Figure 4.1, it also benefited from the alternative energy push during the second oil crisis but suffered from high costs and low performance. Therefore, it dwindled after 1986. Technological improvements with a concurring decline in costs led to a re-emergence from the mid-1990s. After the Rio conference of 1992 a remarkable increase took place, which petered out in the late 1990s.

Wind power development for small applications started in the 1980s (see Figure 4.2). At this time it was seen as rural development policy and did not really depend on the price of oil, thus remaining at a high level until 1990. When the Danish and German development of wind technology led to robust large-scale wind turbines for electricity generation a second peak of project development started in the mid-1990s, when it almost reached the level of solar projects. Since then project inflow has decreased as wind power has become a large industry that is fully commercial with revenues from sales of emissions credits under the CDM. Only 'first of its kind' projects in countries without any wind power experience continue to be financed by development assistance.

Figure 4: Solar and wind

Figure 4.1: Solar projects as a share of all aid projects

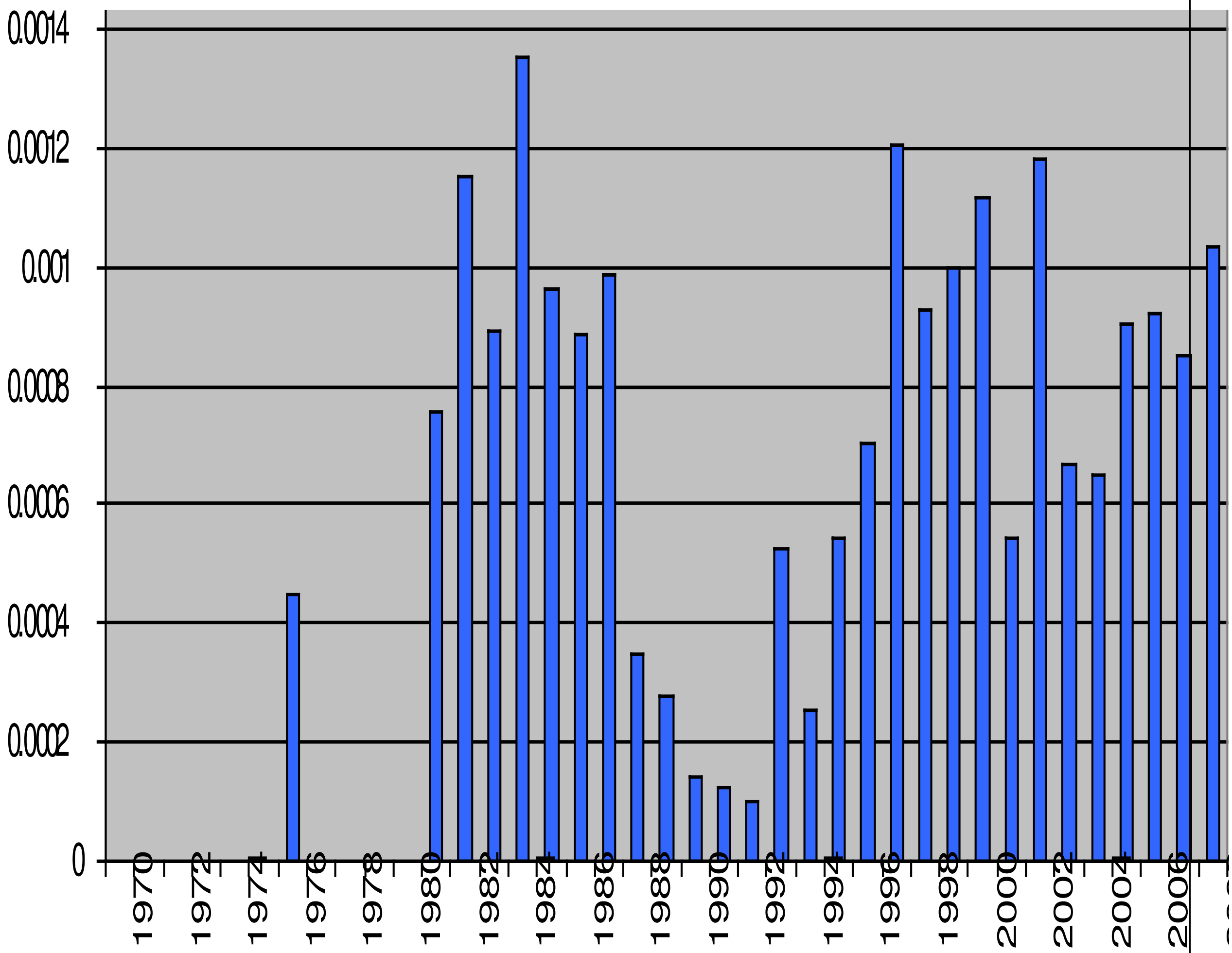
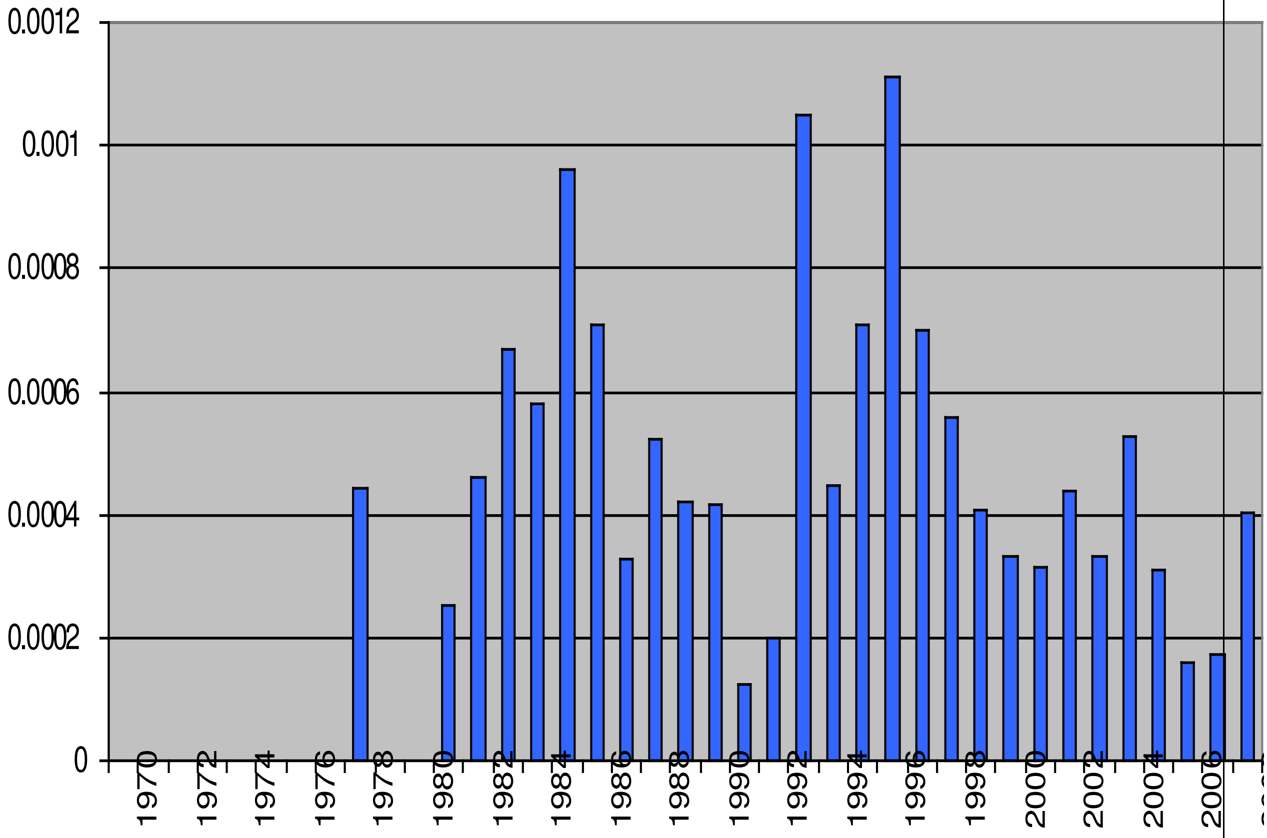


Figure 4.2: Wind projects as a share of all aid projects



Source: AidData (2010), authors' coding

Biomass power was part of the generic renewable energy upswing during the second oil crisis but lost lustre after the oil price crash in 1986 (see Figure 5.1). During the 1990s successes with bagasse cogeneration in Brazil (Coelho and Bolognini, 1999) led to renewed attempts to promote agricultural residue-based power plants. Moreover, by the 1990s the technology was fully mastered and could guarantee performance (Purohit and Michaelowa, 2007). The slowdown in the first half of the 2000s cannot be attributed to any specific event. Perhaps the availability of the CDM as an alternative source of finance led to a reduction of the donors' willingness to support a technology that was seen as commercially viable with CDM revenues. Overall numbers of biomass projects were historically lower than for the other renewable energy types but are now on a par with wind.

Biogas plants are a modular technology with strong rural development benefits. The focus on alternative energy in the context of the second oil crisis in the 1980s triggered initial activities, but performance was often a problem and thus project numbers fell (see Figure 5.2). Only very recently an increase to 1980s levels could be observed. Overall biogas project numbers are several times smaller than for other renewable energy technologies.

Figure 5: Biomass and biogas

Figure 5.1: Biomass projects as a share of all aid projects

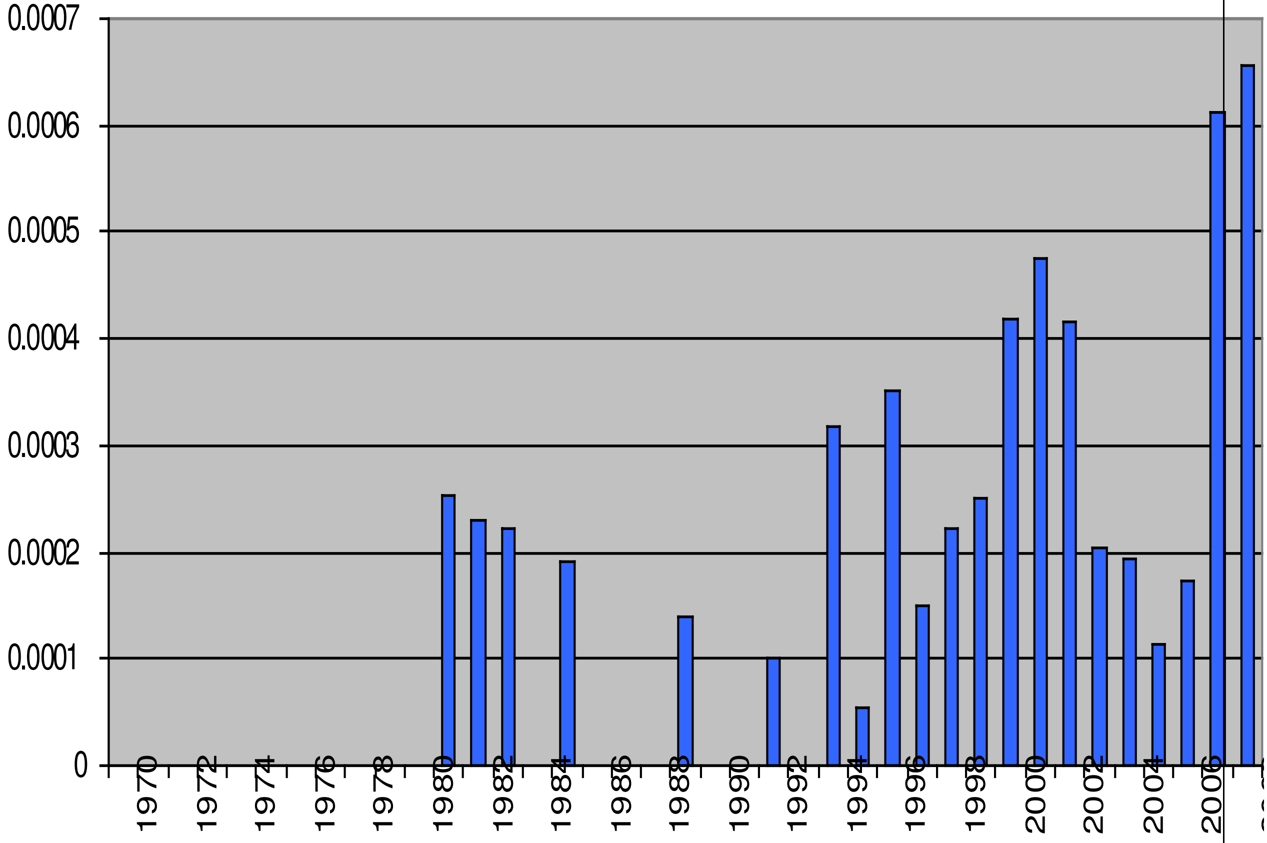
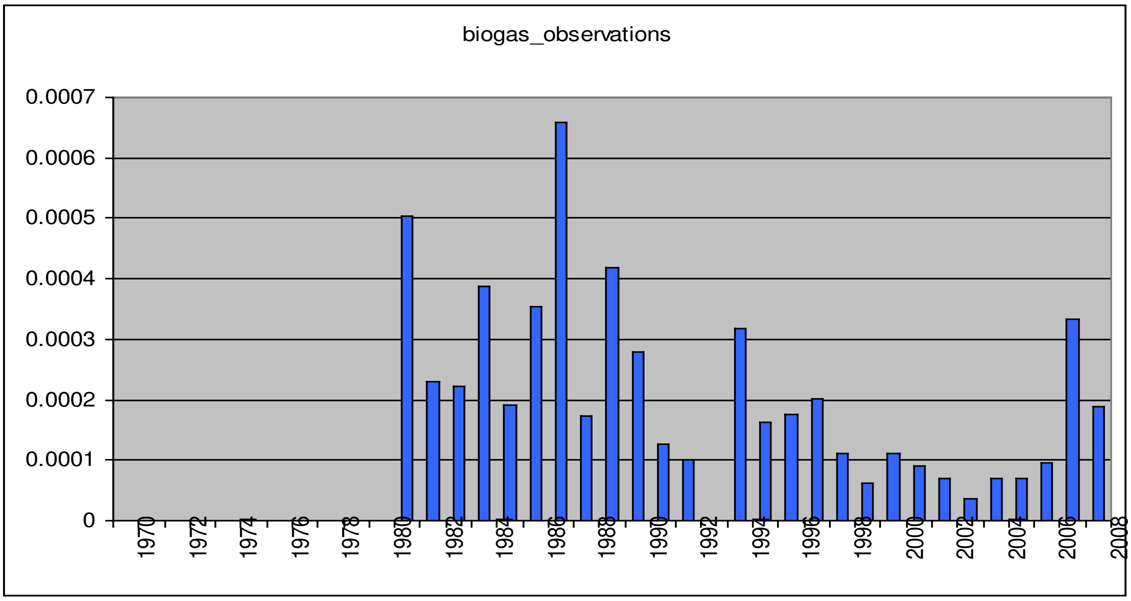


Figure 5.2: Biogas projects as a share of all aid projects



Source: AidData (2010), authors' coding

Other renewable energy projects are even more recent. Landfill gas projects focus on advanced countries that have a development level sufficient to ensure a coordinated waste management strategy; landfills need to be lined and delivery of organic waste ensured. As their energy benefit is relatively small, but the GHG benefit large due to the high warming potential of methane, they have only been discovered since the Kyoto Protocol. When it became clear after 2005 that the CDM would generate sufficient revenues to mobilise landfill projects donor interest decreased. Many of the projects do not generate energy but just flare the methane. Project numbers are comparable to those for biogas (see Figure 6.1).

Finally, there are also cross-sectoral projects that address renewable energy in general, such as support in developing incentives for renewable investments, resource measurements and multi-technology activities. They had their first great upswing during the second oil crisis, when alternative energy was seen as the answer (see Figure 6.2). But initial high expectations were disappointed when performance problems plagued the projects. Nevertheless, projects continued to come in, albeit on a lower level. Only after signature of the Kyoto Protocol is a significant increase visible. The third oil crisis appears to have triggered a further increase, reaching a value double that of the largest single-technology category.

Figure 6: Other renewable energy and combined projects

Figure 6.1: Landfill gas projects as a share of all aid projects

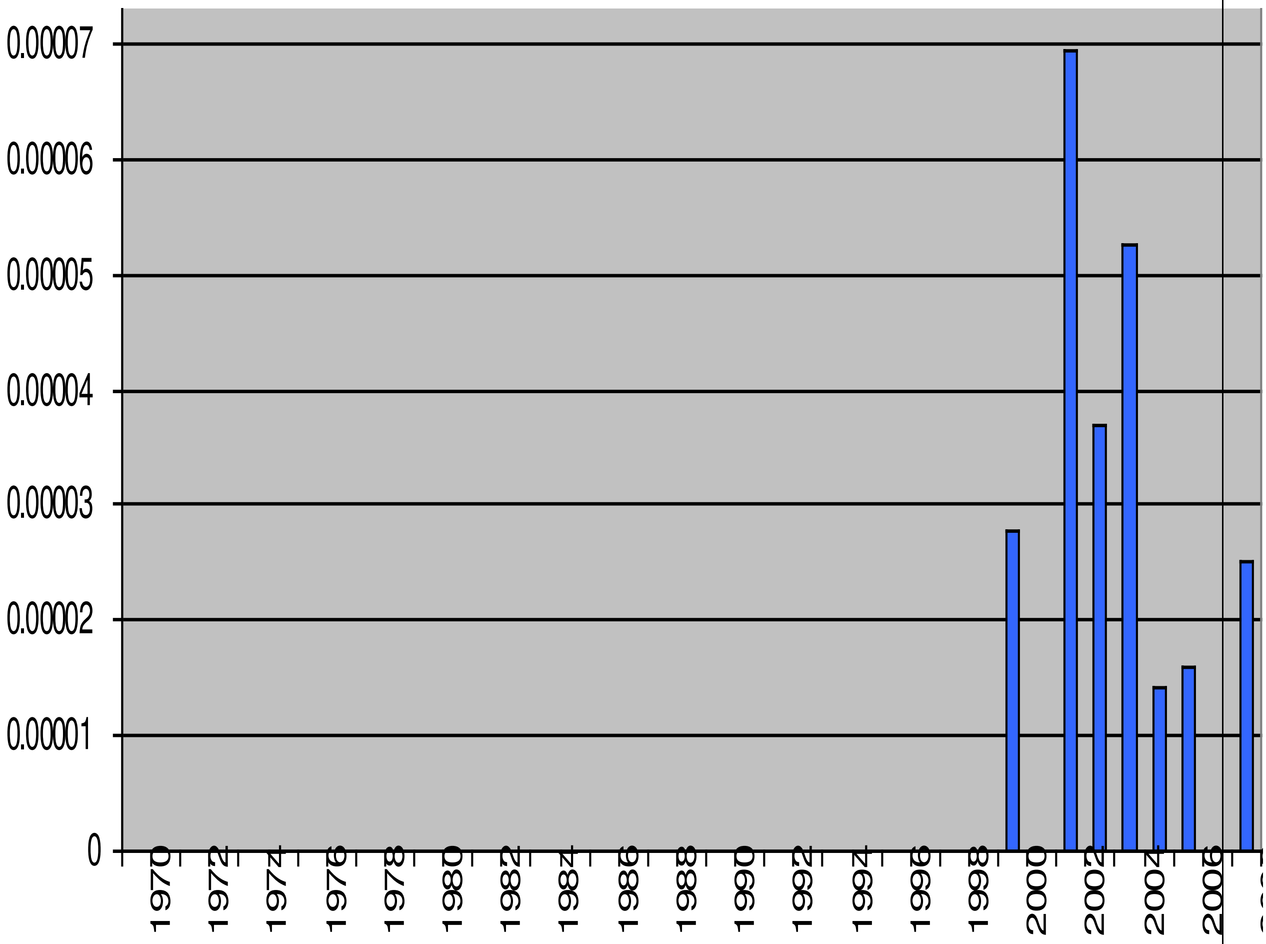
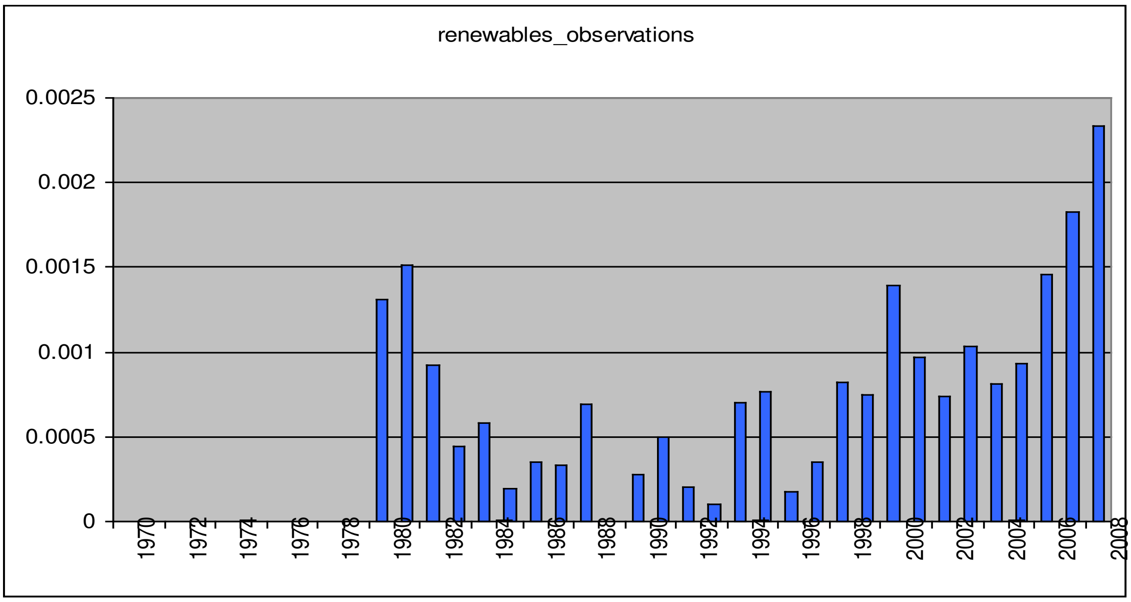


Figure 6.2: Renewable energy cross-cutting projects as a share of all aid projects



Source: AidData (2010), authors' coding

4.2 Energy efficiency

It is not easy to obtain a comprehensive overview of energy efficiency projects because they can occur in many different guises. We focus on key technologies, such as power plant rehabilitation, cogeneration and cookstove efficiency.

Efficiency improvement in power generation and industry requires specific engineering expertise which is usually not prevalent in development assistance administrations. In general, such measures have very low costs but face numerous commercial and political barriers as well as split incentives; a commercially attractive project may not be undertaken because the tenant benefits but the landlord would have to bear the investment. In the mid-1990s large energy efficiency projects were fashionable due to the end of the Cold War and the related market transformation activities in many formerly socialist countries (see Figure 7.1). However, the gap in the early 2000s is difficult to explain. Perhaps donors thought that the rising price of oil would mobilise efficiency improvements without any need for donor involvement. Project volumes have reached a level comparable with the larger renewable energy categories.

As opposed to cogeneration, cookstove efficiency improvement projects can be well integrated into integrated rural development strategies in very poor countries, particularly in Sub-Saharan Africa. They were very fashionable in the 1980s (Hyman, 1987), before performance problems with the many competing stove designs led to a 'hangover' (see Figure 7.3). After the success of the Kenyan 'Jiko' stove, of which over two million were sold through private entrepreneurs during the 1990s (Theuri, 2005), stove projects picked up again from 1999, especially given their substantial CO2 reduction contribution at low cost. But they have not reached their former peaks, which is probably due to an increase of competing NGO activities and a tendency to operate them on a private business model (Bailis et al., 2009). Project numbers have reached less than half of the average of renewable energy technologies with the exception of the 'fashion period' in the mid-1980s, which is probably due to the organisational challenges compared to other renewable energy projects.

4.3. Some preliminary conclusions

The detailed discussion of individual project types shows that not all of them have evolved in the same way. Differences are related to technological development and to the extent to which certain technologies have been seen as cost-efficient substitutes for other energy sources. At the same time we observe trends that seem to be related to certain fashions and even to the success of specific marketing campaigns. Overall, the price of oil appears to play a dominant role leading to distinct peaks of project shares in the early 1980s for virtually all renewable energy and energy efficiency projects, except for those which were simply not known at that time. This provides strong support for the related 'old wine' hypothesis. At the same time, only a few project types, such as landfill gas and to a minor extent biomass and solar, also show trends that coincide with key international climate policy events like the Rio and Kyoto conferences.

In the following section we will see whether, as a whole, these global political developments have a significant effect. In addition, we will examine whether we can observe any effect of political developments at the national level in donor countries. With respect to the 'old wine' model, we will more systematically examine not only the relevance of the price of oil but also the relevance of any given donor's comparative advantages.

Figure 7: Energy efficiency

Figure 7.1: Efficiency projects as a share of all aid projects

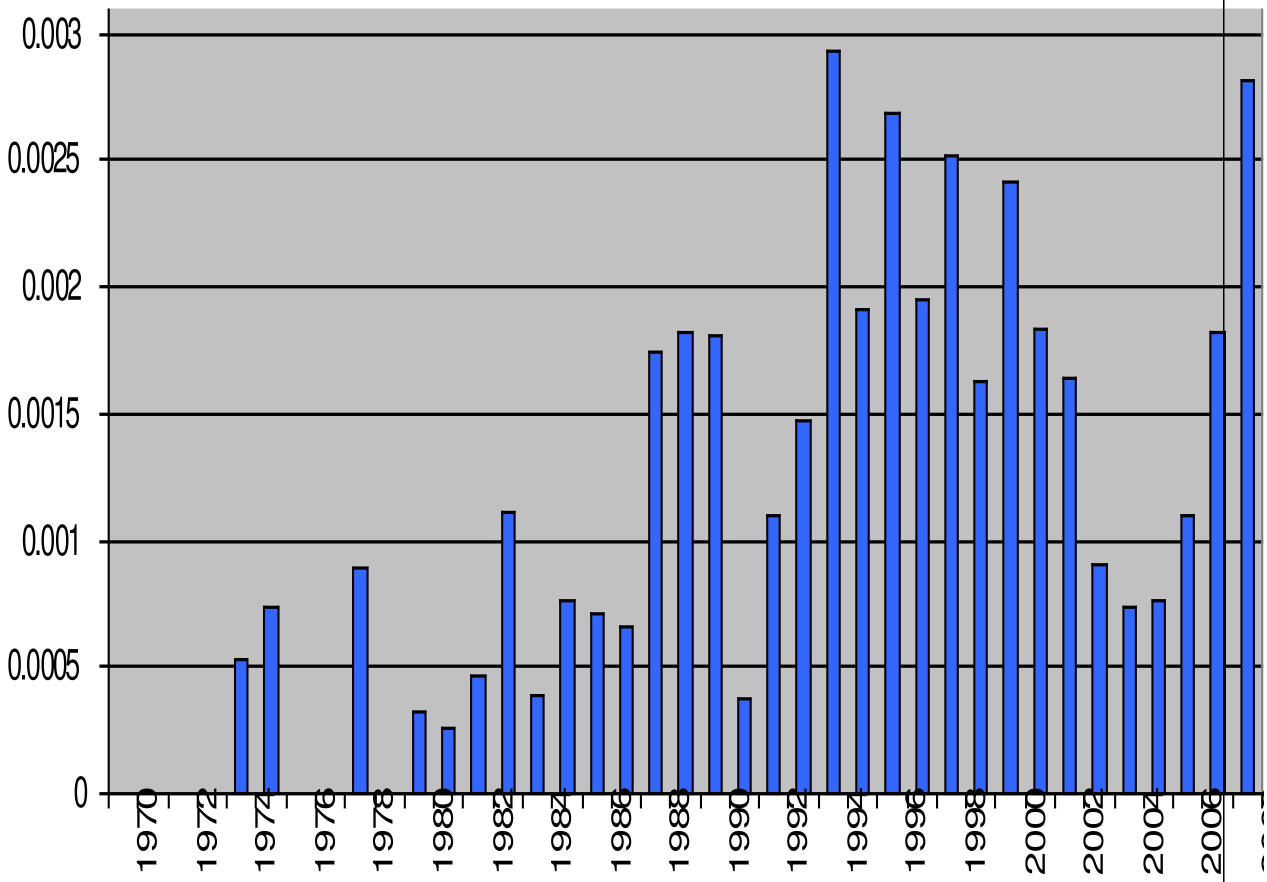


Figure 7.2: Cogeneration projects as a share of all aid projects

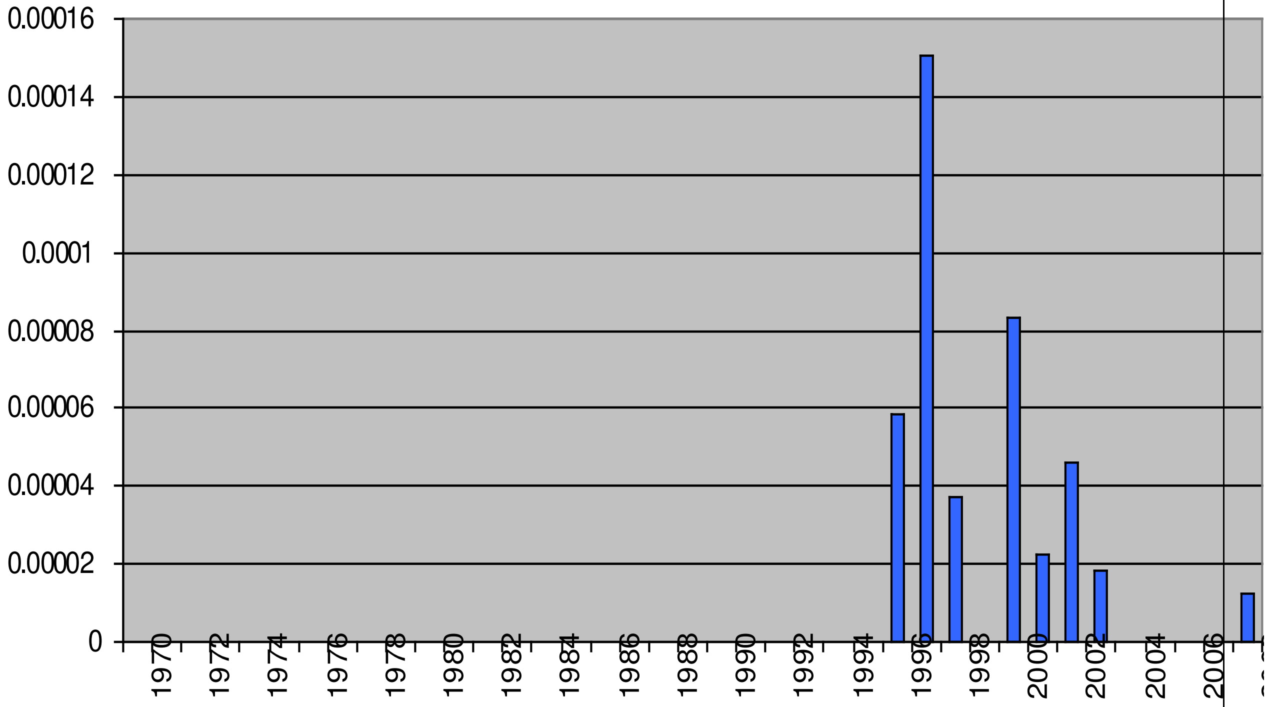
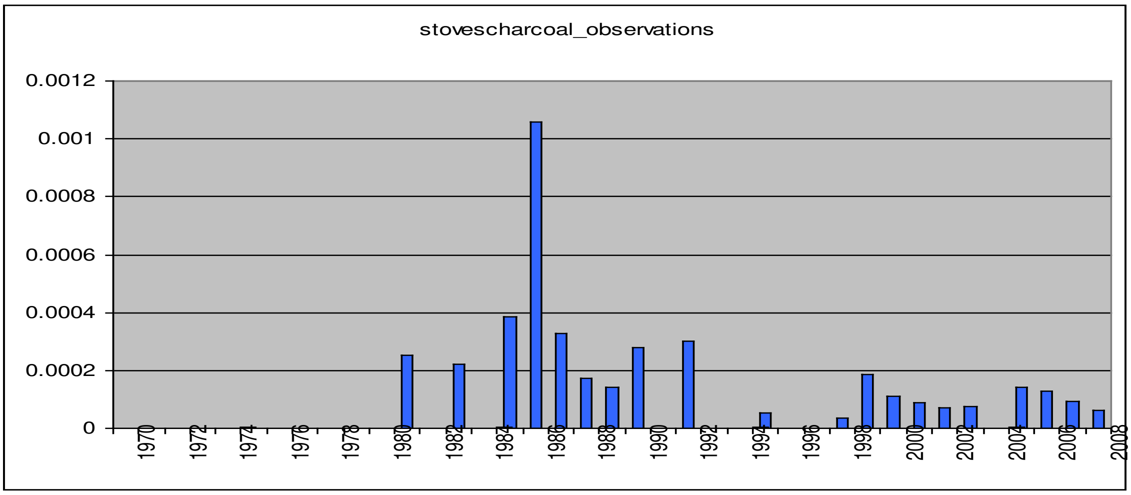


Figure 7.3: Cookstove efficiency projects as a share of all aid projects



Source: AidData (2010), authors' coding

5. Which parameters do count: results of the econometric analysis

The regression analysis, details of which are described in Appendix 1, is carried out for all renewable energy and energy efficiency projects (that is, in fact, all mitigation projects) jointly because the sub-sectors considered above may partially be a substitute for each other when governments try to adjust their aid budgets to policy change or change in traditional determinants such as the price of oil.

Results in all regressions related to project numbers clearly confirm the significance of the price of oil. Considering the results of Regressions 2 and 3 (see Appendix 1) implies that a USD 10 increase in the price of oil leads to a 7 per cent higher probability of mitigation aid and to an increase in the project share of mitigation projects by 0.15 percentage points. Considering that the average project share is only 1 per cent, this increase is substantial. As could be expected from the visual analysis of Figures 1.2 and 2 in Chapter 4, no such effect is observed for mitigation-related commitments.

With respect to the other 'old wine' variables, the picture is less clear. The indicators of donors' comparative advantage in different renewable energy sectors tend to have the expected positive effect on the decision whether at all to provide mitigation aid but are less clearly significant in the aid allocation equations. This is true, in particular, for hydro power, where the donor's home country experience with the technology seems to have a strong impact on the country's decision to provide some aid in the area, but does not seem to drive the decision regarding either the number of projects or the financial volume committed. In the allocation regression of project shares only the donors' capacity in wind energy is significant. In the regression of commitment shares only the donors' production of solar energy turns out to be significant.

Turning to the variables of the policy change hypotheses, we observe a positive effect of the Rio conference on the decision to provide some mitigation aid. The effect is very strong, indicating that from 1992 onwards the probability that donors would allocate at least some aid to mitigation increased by 35 percentage points (Regression 3). The Rio conference is also reflected in higher project numbers, although this effect is not significant at the 5 per cent level (p-value of 9 per cent).

After the Kyoto conference in 1997 and the ratification of the Kyoto Protocol in 2005, however, the trend is reversed. We obtain negative coefficients in almost all regressions, and the negative coefficients for the post-Kyoto dummy are significant in both allocation equations related to project numbers as well as commitments. In fact, the post-Kyoto dummy is one of only two variables significant in the commitment regression. Even more strikingly, the negative coefficients are so high (in absolute terms) that they over-compensate the positive effect of the Rio dummy. It seems as if donors tried to work on an integration of climate change mitigation into aid in the preparation of the Kyoto conference, whereas they considered that enough time and effort had been spent on this issue once the conference was over. Global political trends thus appear to play a role, but not always in the way one would expect.

Donors' national political trends towards environmental preferences also do not uniformly show the expected effect. The share of green parliamentarians is positively significant only in the selection equation, while it is even negatively significant in the allocation equation. On average, greener donor parliaments thus seem to lead to a higher probability of being active in the area of aid related to renewable energy and energy efficiency, but this does not increase the share of projects or commitments. This is in contrast to climate aid *reporting* in this area, which has been shown to be significantly and positively related to green voting preferences (Michaelowa and Michaelowa, 2010a). The presence of left-wing or right-wing governments does not seem to have any effect either.

All in all, looking at the project shares, we find strong evidence for the 'old wine' model driven by the oil price variable. We also find evidence for the policy change model, but this clearly works in the expected direction only for the impact of the Rio conference and even shows a reverse trend thereafter. Local political variables do not show any clear effect.

As expected, the explanatory power of the commitments regression is much lower, but even here we find the negatively significant effect of the Kyoto conference. This is intriguing because it confirms that policy-makers do react to global trends but that large international conferences may sometimes mark the end of the efforts rather than their beginning. Subsequent to the conference, new topics take up the policy-makers' attention and the promises made at the conference are rapidly forgotten. This effect is also visible in the large numbers of newly created financing mechanisms, only a few of which are ever funded sufficiently.

It should be noted, though, that the overall picture drawn here may hide substantial differences between individual donors. While we consider fixed effects, we do not consider interaction terms with the different explanatory variables or individual regressions for each donor (which would be of limited value given the relatively small number of observations by country). Our analysis thereby only shows the effects on average.

A group of important countries has actually reduced renewable energy and energy efficiency aid projects over time. One can differentiate these countries into two groups. The first consists of those that were quite active during the second oil crisis (and sometimes also during the 1990s) but where an event such as the advent of a government hostile to climate policy led to a drying up of climate-related aid flows. Both the US and Australia (which opposed the Kyoto Protocol) exhibit these patterns, as well as Canada (whose government elected in early 2006 essentially envisages not complying with the Kyoto Protocol commitments) and Italy (where the Berlusconi government has repeatedly voiced doubts about the relevance of climate change).

The temporal patterns differ among the countries, but in all four cases a large number of aid projects during the second oil crisis was followed by a decline in the late 1980s. In Australia and the US a short-lived revival occurred during the 1990s, which is absent in Italy. In Canada the downward trend was broken in 2000-05 but resumed after the Conservative government took office. It is obvious that the repudiation of the Kyoto Protocol played a key role in the declines seen in Australia, Canada and the US.

A second group of countries with declining aid for mitigation – France, Japan, Switzerland and the United Kingdom (UK) – has consistently supported international climate policy, with the UK even claiming to be a pioneer in the field. Apparently these governments were not willing to sustain the relatively high share of energy projects achieved during the second oil crisis. The development over time differs between countries. France shows a secondary peak in the late 1980s, Japan in the run-up to the Kyoto conference, Switzerland immediately after the Rio Conference and the UK in the early 1990s.

We can identify a few countries that have been traditionally active in development policy, whose governments see themselves as climate policy pioneers and which indeed showed increased activity not only during the second oil crisis but also, at least to some extent, at the time when climate policy became relevant. Germany exhibits a very strong mid-1990s peak, probably linked to the first Conference of the Parties to the UNFCCC held in Berlin in 1995, with minor peaks during the second oil crisis and in the late 2000s. The Netherlands has a post-Kyoto peak and a second oil crisis peak. Norway has a late 1980s peak which coincides with a very active period for this country at the international climate policy negotiations. While equally perceived as a strong promoter of climate change mitigation, Sweden shows a peak during the second oil crisis which is higher than that of the late 1990s, and the country is on the verge of becoming a member of another group of countries with a long-term decline in mitigation aid.

Finally, some countries show no, or only rare, cases of projects in renewable energy and energy efficiency before the end of the 1980s, but continuous activity thereafter. They include countries with a long history of development cooperation (Denmark and Finland) but also relative newcomers (Austria and Spain). In these cases it is likely that the rise of climate policy triggered the mitigation aid activities. Graphical illustrations of these country cases can be found in Annex 2, Figures A.1 – A.4.

6. Conclusion

In contrast to popular belief and expectations in the scientific literature, the advent of international climate policy in the 1990s did not boost renewable energy and energy efficiency projects in bilateral development cooperation, which is responsible for the lion's share of overall aid. Overall, the share of mitigation projects in total bilateral development assistance projects fell significantly from the second oil crisis peak reached in 1981 and reached a low in 2005, only returning to 1990s averages in 2008. The Rio summit comes along with a significant increase in aid related to these projects. But the Kyoto conference in 1997, with the agreement of the Kyoto Protocol, and the ratification of the Kyoto Protocol in 2005 did not reinforce but rather reversed this trend.

The share of financial mitigation commitments shows two peaks: one during the second oil crisis and one in the mid-to-late 1990s. Again, Kyoto seems to have reduced climate-related aid rather than to have enhanced it. This is one of the few variables with a significant effect on commitment shares.

A technology-specific assessment finds a strong decline in 'traditional' renewable energy projects such as hydro and geothermal power from their peak in the early 1980s. The 'new' renewables such as solar, wind and biomass show twin peaks in the early 1980s and the late 1990s. Only cross-technology renewable energy projects surpassed the early 1980s peak in the mid-2000s. Energy efficiency projects increased substantially until the mid-1990s, but went through a weak phase in the mid-2000s. The decline in mature technologies may be due to the emergence of the CDM and the revenue from the sale of emissions credits, which led to private sector investments and reduced the need for projects financed by development aid.

Donor countries exhibit distinct patterns. Apart from countries opposing climate policy such as the US, Australia, Canada and Italy, France, Japan, Switzerland and the UK show decreasing engagement in the sector. In countries like Germany, the Netherlands, Norway and Sweden mitigation-related aid does not exhibit a clear trend but shows peaks related to both, the oil crises and global political developments. Yet another group of countries has started mitigation-related support only since the emergence of climate policy as a major issue in the late 1980s and early 1990s. It consists of Austria, Denmark, Finland and Spain. Only in these cases is it obvious that really ‘new’ mitigation development assistance has been provided.

All in all, fears that development assistance may have been diverted from its central priorities through a new policy drive towards climate mitigation do not seem to be justified. On the contrary, it seems that donors have deliberately provided the impression that they increased aid for climate mitigation. While the policy change model is correct in that international conferences appear to have been turning points for donors’ aid allocation, the turn did not always happen in the expected direction. At the same time considering the existing aid related to renewable energy and energy efficiency only as ‘old wine’ also appears to be only partially appropriate. Nevertheless, the single most robust variable in explaining the change of renewable energy and energy efficiency over time is the price of oil, independently of any change in global or national environmental preferences. In the future statements regarding the increase of aid for a politically fashionable purpose should always be treated with caution. A policy recommendation would be to require calculation of aid allocations for the new purpose not only for the current budget year but also for the past.

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APPENDICES

Appendix 1: Details of the econometric analysis and variable descriptions

As there can be no negative project shares, the data are censored at zero. One option to econometrically deal with this type of data is to use a Tobit model. Results of this estimation are shown in column 1 of Table A.1. However, the Tobit model is problematic when the general decision about aid activities in the area of mitigation ('selection equation') is not driven by the same determinants as the decision on project numbers or actual aid volume, given that mitigation aid is non-zero ('allocation equation'). To find out whether there may be such problems, we also present the selection and the allocation equations separately (columns 2 and 3 versus columns 4 and 5). The analysis demonstrates that for certain variables the coefficients show the opposite signs (compare for example the coefficients of Regression 3 and Regression 5 for solar production). This leads us to prefer the separate estimations.

Table A.1: Determinants of mitigation aid

Dep. Var.	Regression 1 Tobit Mitigation project share	Regression 2 Logit, FE Dummy for Mitigation project share >0	Regression 3 OLS, FE Dummy for Mitigation project share >0	Regression 4 OLS, FE Mitigation project share (for share >0)	Regression 5 OLS, FE Mitigation commitment share (for share >0)
'Old wine'					
Oil price	0.000446 **	0.055 **	0.0073 **	0.000156 *	0.000072
	(0.00)	(0.00)	(0.00)	(0.02)	(0.62)
Capacity hydro	0.000174	0.369 **	0.0152 **	-0.000012	-0.000451
	(0.21)	(0.00)	(0.00)	(0.97)	(0.47)
Capacity wind	0.000001	0.004 *	0.0000	0.000001 *	0.000001
	(0.26)	(0.01)	(0.79)	(0.02)	(0.23)
Capacity geothermal	0.000004	0.040 *	0.0002 *	0.000000	-0.000002
	(0.29)	(0.01)	(0.01)	(0.99)	(0.79)
Production solar	-0.000036 *	0.026	-0.0005 *	-0.000019	0.000058 *
	(0.01)	(0.92)	(0.03)	(0.06)	(0.01)
Policy change					
Post-Rio	0.019321 **	2.799 **	0.3471 **	0.004223	0.001143
	(0.00)	(0.00)	(0.00)	(0.09)	(0.83)
Post-Kyoto	-0.006632 *	1.083	0.0633	-0.010265 **	-0.013824 *
	(0.02)	(0.11)	(0.14)	(0.00)	(0.01)
Post–Kyoto ratification	-0.014477 **	-3.418 **	-0.1780 **	-0.007963 *	-0.006786
	(0.00)	(0.00)	(0.00)	(0.02)	(0.35)
Green seats	0.001784 **	0.469 **	0.0502 **	-0.000932 *	-0.000293
	(0.00)	(0.00)	(0.00)	(0.04)	(0.76)
Cabinet composition	-0.000543	-0.179	-0.0111	0.000292	0.000028
	(0.37)	(0.08)	(0.22)	(0.61)	(0.98)
Overall sign. P-value	0.00	0.00	0.00	0.00	0.00
R^2 (within)			39.93%	12.37%	5.34%
N	780 (287 censored + 493 uncensored)	780	780	493	493
No. of donors	21	21	21	21	21

Notes: OLS: ordinary least squares. Constant and fixed effects (FE) not shown. P-values in parentheses, ** for coefficients significant at the 1 per cent level, * for coefficients significant at the 5 per cent level.

In addition, a Hausman test strongly suggests the use of donor fixed effects to avoid bias. This also favours the separate estimation of the selection and the allocation equations because the Tobit model is based on a random effects approach.

Unfortunately, estimating the selection equation separately with a Logit fixed effects approach also creates problems. First, we may face an incidental parameter problem. Circumventing this problem through the use of a conditional Logit would make us lose a substantial amount of observations as year-to-year changes from zero to positive mitigation project numbers are not very frequent. However, as our time series is relatively long (covering almost 40 years), the potential inconsistency implied by a standard fixed effect Logit model should be rather limited.

Second, and more difficult to solve here, is the fact that the standard Logit model explains our results too well. Out of 780 donor/year observations, it completely determines one failure and

68 successes. This generated some instability in the estimation and made it impossible to compute marginal effects at the mean of the explanatory variables.

In order to be sure that our results are meaningful, we thus also carry out a simple OLS FE regression for the selection equation. This linear probability model is shown in Regression 3. Finally, we present two different allocation equations limiting the sample to those observations with non-zero values of mitigation aid. The first of these (Regression 4) uses our key dependent variable, namely the share of mitigation-related projects within overall aid. The second (Regression 5) uses the share of commitments rather than the share of individual aid projects. Based on our discussion in Section 4, which points to a reaction of donors through new projects rather than higher volumes, we would expect this last regression to have less explanatory power than Regression 4.

All explanatory variables relating either to the 'old wine' model or to the policy change model are included simultaneously in the regressions in order to avoid omitted variable bias.

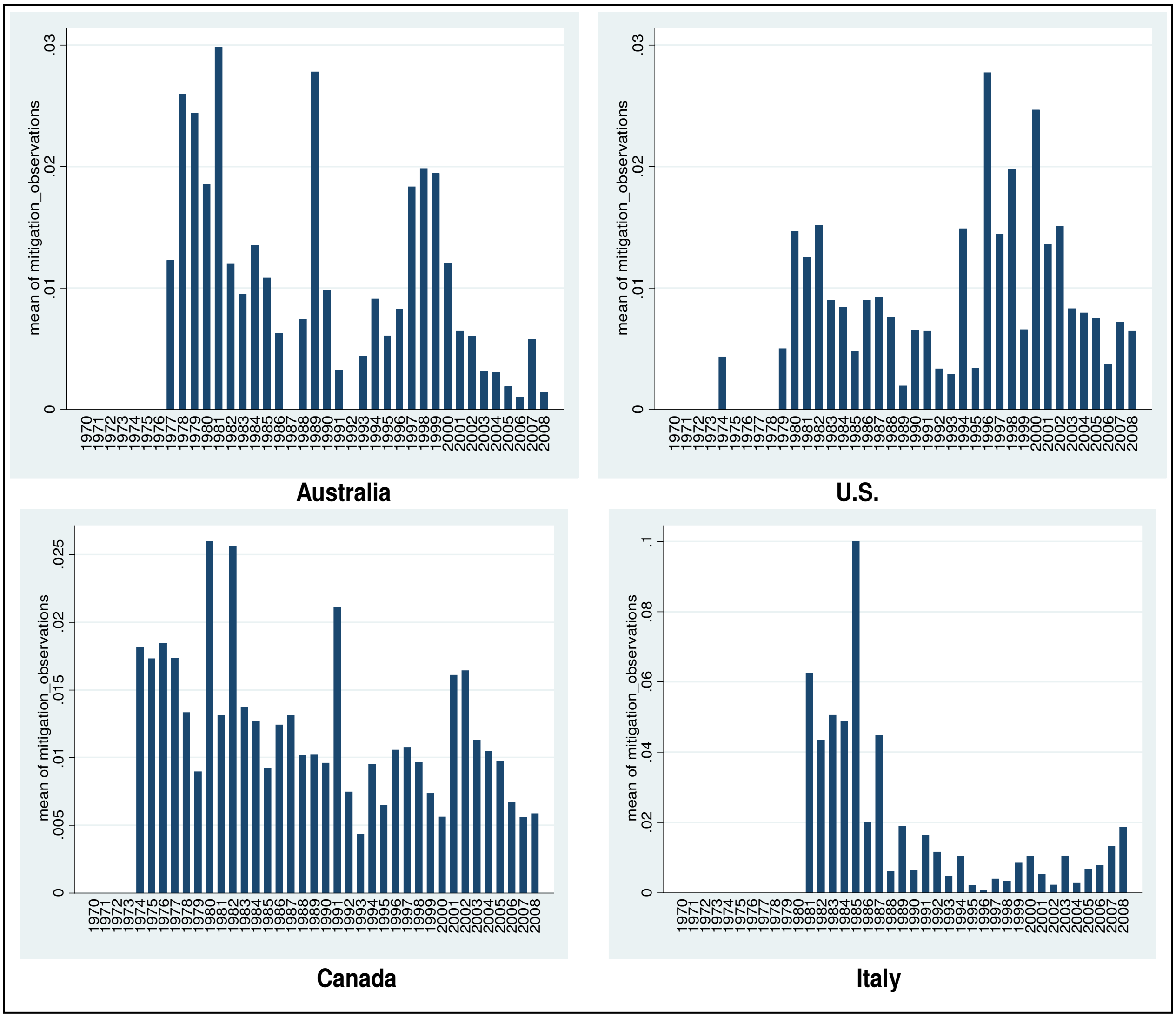
Table A.2: Variable description

Variable	Mean	Std. Dev.	Min	Max	Source
Mitigation project share	0.01	0.016	0	0.17	AidData (2010), authors' coding[1]
Mitigation commitment share	0.02	0.036	0	0.33	AidData (2010), authors' coding[1]
Oil price: refiner acquisition cost of imported crude oil, constant 2005 USD	34.5	18.46	7.40	85.13	Energy Information Administration (2010a)
Capacity hydro: installed hydro power capacity in donor countries, in GW (imputed until 1980 and for 2008 using hydro power production in kWh)	14.42	20.19	0	90.3	Energy Information Administration (2010b)
Capacity wind: installed wind power capacity in donor countries, in MW	600.3	2412.4	0	25170	Worldwatch Institute, (2001), Chinese Renewable Energy Industries Association (2007), American Wind Energy Association (1999), Global Wind EnergyCouncil (2009)
Capacity geothermal: installed geothermal power capacity in donor countries, in MW	130.1	465.39	0	3043	International Geothermal Association (2010), Bertani (2007), Geothermal Energy Association (2008, 2010), Amici de la Terra (2008), Cappetti, Passaleva and Sabatelli (2000), Kawazoe and Combs (2004), Cabeças, Carvalho and Nunes (2010), Sifford and Bloomquist (2000), US Department of Energy (1997), Lund (2004)
Production solar: Solar photovoltaic cell production in donor countries, in MW	15.76	96.2	0	1331	Worldwatch Institute (2004), Prometheus Institute (2007), Prometheus Institute and Greentech Media (2009), IEA (various years)
Post-Rio: dummy (= 1 if year ≥1992, = 0 otherwise)	0.44	0.50	0	1	
Post-Kyoto: dummy (= 1 if year ≥1997, = 0 otherwise)	0.31	0.46	0	1	
Post-Kyoto ratification: dummy (= 1 if year ≥2005, = 0 otherwise)	0.10	0.30	0	1	
Green seats (share of seats in national parliament, in %)	2.42	3.42	0	13.3	Armingeon et al. (2008)
Cabinet composition (Schmidt index: from 1: hegemony of right-wing and centre parties, to 5: hegemony of social-democratic and other left-wing parties)	2.50	1.62	1	5	Armingeon et al. (2008), Schmidt (1992)

[1] The base data to compute this share are available as an online appendix to Michaelowa and Michaelowa (2010a) at http://www.cis.ethz.ch/publications/publications.

Appendix 2: Development of mitigation aid over time, selected country cases

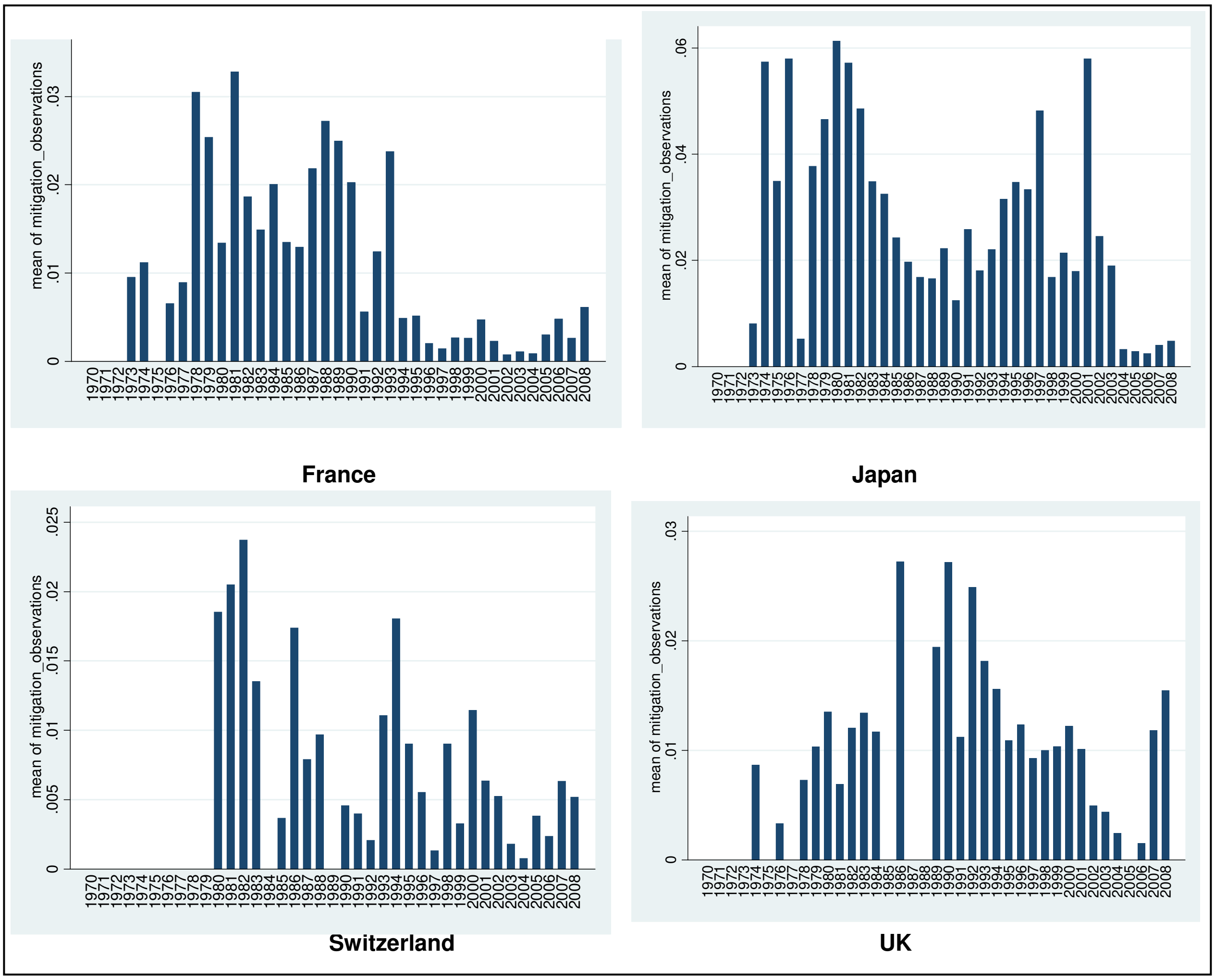
Figure A.1: Decreasing aid for mitigation projects from governments sceptical of climate policy[1]



[1] Share of total number of development assistance projects.

Source: AidData (2010), authors' coding

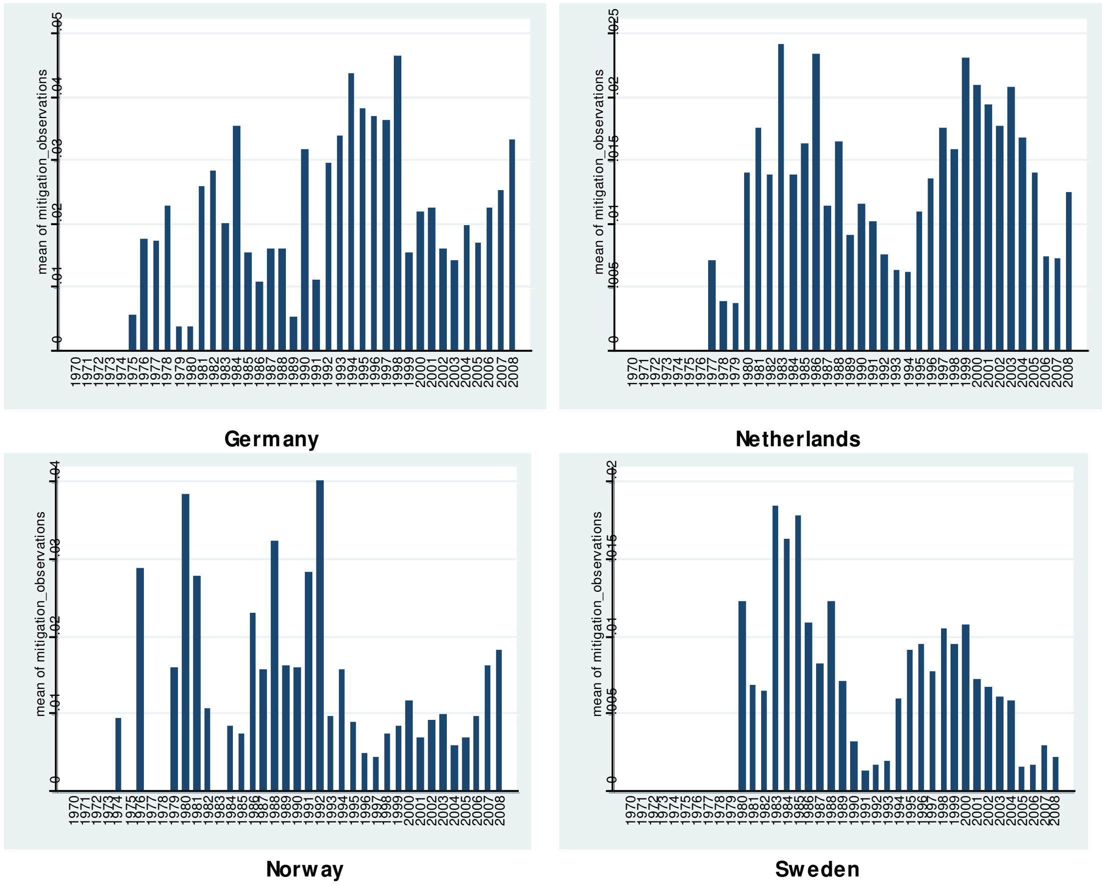
Figure A.2: Decreasing aid for mitigation projects from governments supporting climate policy[1]



[1] Share of total number of development assistance projects.

Source: AidData (2010), authors' coding

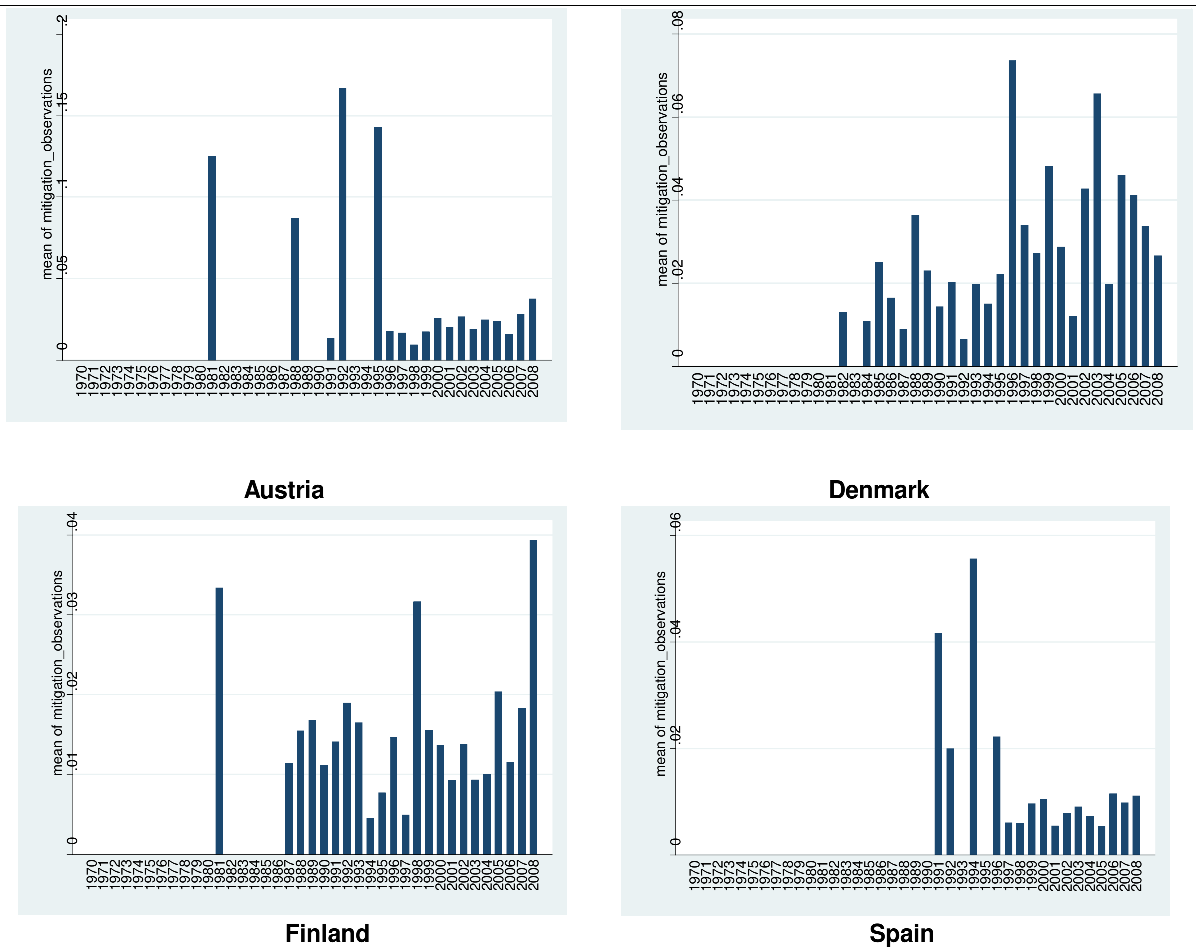
Figure A.3: Oscillating aid for mitigation projects[1]



[1] Share of total number of development assistance projects.

Source: AidData (2010), authors' coding

Figure A.4: Onset of aid for mitigation projects only after the start of climate policy[1]



[1] Share of total number of development assistance projects.

Source: AidData (2010), authors' coding